Space Weather Forecast

Issued on Thursday, 19 October 2023 at 13:01 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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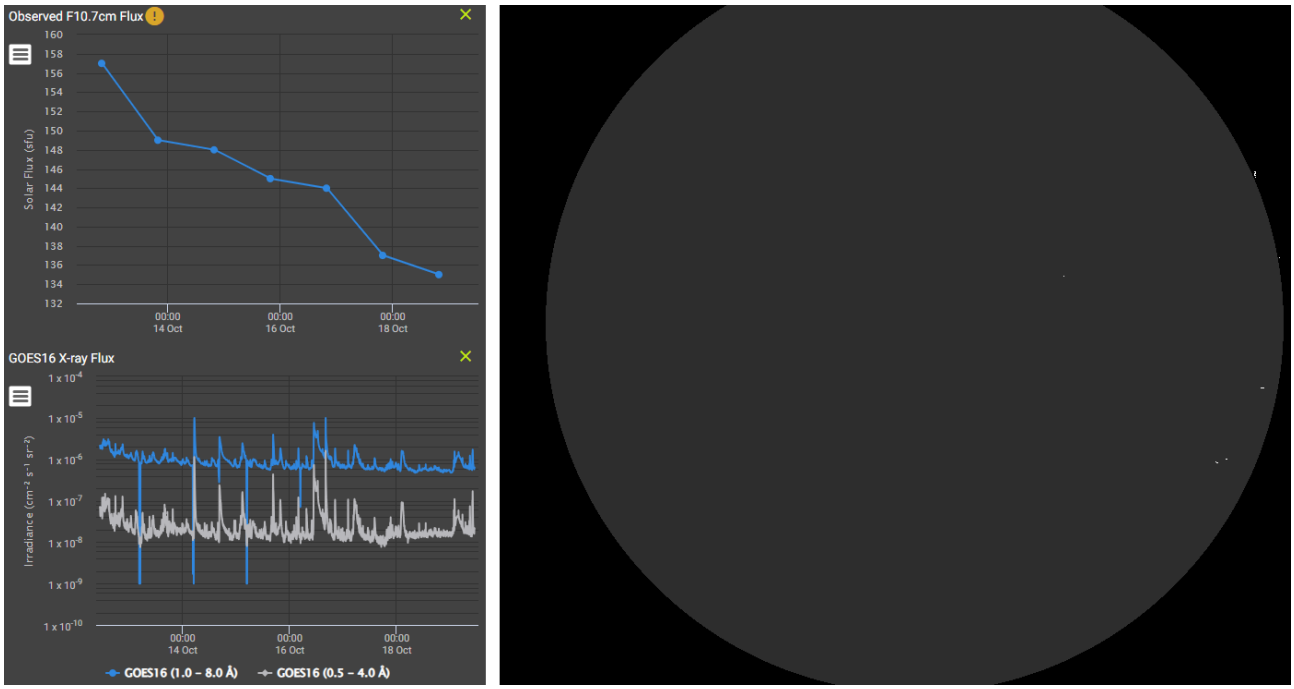
Space Weather Forecast Headline: Weak CME arrivals possible, with a slight chance of isolated G1/Minor Geomagnetic Storm intervals throughout.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been notably low over the past 24 hours, with the X-ray background trace comfortably below even Common class. Peak activity was confined to low Common-class flares, with limited highlights being a long-period event around 19/0330UTC from the off-going northwestern solar horizon, and a more impulsive one from a similar location at 19/1000UTC.

Figure 1: Clockwise from top left: Past week in terms of a proxy for sunspot number and activity, showing a decline over the past seven days; SIDC ROB-derived X-ray flares of Common-class and above, showing few flares even registering, and those that have lying near the offgoing western solar horizon; X-ray flux, showing a declining intensity and cadence of significant flares.



There are currently up to five sunspot regions on the facing side of the Sun, all of which are relatively small and simple, and either stable or in decline.

Two main Coronal Mass Ejections (CMEs) were noted on imagery, apparently heading to the northwest and bookending the 24-hour period. Both of these events were analysed as far-sided to

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no effect at Earth.

Solar Wind / Geomagnetic Activity: The solar wind showed influence from a modest coronal hole fast wind. In addition to this, there is possibly some contamination from either or both of the outstanding 14 October glancing CMEs, which had been due into the very start of the 24-hour period. While not conclusively present, these CMEs are now likely to have passed Earth and are dropped from further mention in the forecast.

The solar wind speed rose to peak at slightly elevated levels around 18/1600UTC, gradually waning to a more typical background to end the period. The number of particles comprising the solar wind was less clear, in part because of switching between the measuring satellites introduced artificial seams and discontinuities - the apparent trend was not far removed from a typical range overall. The magnetic field was highest to start the 24 hours, but later fell from slightly elevated levels to background. Meanwhile, the north-south component was mainly anti-aligned with Earth's field throughout.

The net effect of the above solar wind measures was provisionally below Minor Geomagnetic Storm G1 throughout.

Energetic Particles / Solar Radiation: No solar radiation storms were observed.

Four-Day Space Weather Forecast Summary

Solar Activity: Low to very low activity is expected. There is a slight, but perhaps increasing chance of isolated Moderate-class X-ray flares through the period with any development that occurs on the facing side, as is being seen narrowly over the western solar horizon.

Solar Wind / Geomagnetic Activity: The geomagnetic forecast is best summarised as being complex and carrying high uncertainty, but of overall relatively low magnitude. There is a significant overlap in inbound CME arrival times, and determining individual events as having passed is not likely to be possible.

There are three remaining possibly inbound CMEs. Firstly, a CME originating from 16 October carries a most likely arrival within the coming 24 hours. Secondly, a CME associated with a filament eruption on 17 October may arrive in the 24 hours following. Thirdly and finally, a CME from an eruption on 18 October might follow this event by a further 24 hours. All three therefore have most likely arrival times straddling adjacent UTC days.

Otherwise, current fast winds are expected to soon ease, but with a potential weak enhancement possible from a second stream of fast wind from the end of the current UTC working week onward, however this is also very low confidence.

All considered, there is a slight chance of G1/Minor Storm intervals on all days, perhaps very slightly lessening with time.

Energetic Particles / Solar Radiation: No solar radiation storms are expected.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	10	15	5	5
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	No	10	10	15	20
Very Active	R3 to R5 X	No	1	1	1	1

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	5	5	1	1
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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